Fusion — Elegant Simplicity

By Barry Ashby, <rbashby@aol.com>, (202) 255.0197, Washington Editor, Industrial Heating, May 3, 2007, www.industrialheating.com

The world has a voracious appetite for energy and recently a politically correct interest in "clean" energy, a healthy concern but one poorly understood by the public. So it was shocking to read a major article in Defense News, a pillar of support for the establishment, being critical of the Departments of Defense and Energy for failing to pursue a new fusion technology – the holy grail of clean, inexpensive and inexhaustible energy supply. This issue has great importance, but it is a sad tale about government arrogance and the fading dreams of a national human treasure.

What is involved is fascinating and elegant because of its simplicity. Whereas fission splits heavy atoms into two radioactive atoms, fusion merges two light atoms. Both processes can produce more energy than consumed to make reactions occur, and the dream is to capture surplus energy as electricity. It is best if a fusion process reaction is aneutronic (emits no neutrons, no radioactive wastes, no biohazard, no need for heavy shielding). Seven such reactions have been studied in depth with one of premier status – a hydrogen and boron atom can be fused to form three helium atoms and release 8.7 MEV. This was the genius of Robert W. Bussard, the former deputy director of the Atomic Energy Commission with a doctorate in physics who is now 78 years old and in poor health.

Agreed that this fusion requires hard conditions to achieve (patent #4826646, Method and Apparatus for Controlling Charged Particles), Dr. Bussard showed that it can be accomplished – proven he says Nov. 10, 2005, after spending $14 million in Navy and DARPA funds, compared to $18 billion in federal funds for other fusion work that has produced nothing. Now you see the problem. As stated by Don Gay (former electronics engineer at the Office of Naval Research) and Larry Triola (former deputy chief scientist at the U.S. Navy) and reported by Defense News, "there is a giggle factor because the DOE has pushed billions into fusion reactors the size of factories that consume vast amounts of energy (and dollars) and have yet to produce any." It probably didn't help when Dr. Bussard won the 2006 Outstanding Technology of the Year award last October from the International Academy of Science at the International Aeronautical Congress in Valencia, Spain. The U.S. Navy has conveniently overlooked the other eight world nations that now credibly work in this area, including China, Russia, India and (our best buddy) Cesar Chavez in Venezuela. It is relevant to ask, "Whose team does our tax-paid government work for?"

All this is SO important. This is our national dilemma. This is about whether you can work metal in your factory or turn on the lights when you get home, not about whether federally funded research and development laboratories get budgets approved for federal largess. It is amazing that all this has fallen on deaf ears for so many years, and the reason, certainly, is that the public is too fat and happy to care. What Dr. Bussard reasonably dreams of creating can be achieved, and many who know the issue predict that small, distributed power generation can be working nationwide within 15 years.

The secret is in the containment structure for a hypothetical 5-MW generator, a 3-foot polyhedron that houses a magnetic field that confines an electron plasma. Protons (hydrogen) and boron nuclei are injected into the structure and – both having a positive charge – are attracted to the negatively charged plasma,

where eventually the two nuclei collide and fuse. The boron isotope needed (11B) is 80% of this commonly occurring element used in many commercial and industrial products. It's simple: proton (H) + 11B ® 3 4He + energy. Vacuum pumps remove helium from the chamber, vent it harmlessly and in the process convert its kinetic energy to electrical energy with 85% efficiency and only 10% of the waste thermal energy as compared to conventional combustion power-generation plants. There you have it.

Several companies work in developing these small fusion reactors, sometimes as a class called "spherical tokamaks." The U.S. government, however, wants to spend tax money on what is in the selfish interest of bureaucrats. Too much is at stake to ignore the promise of Dr. Bussard's work, and that message must be conveyed to Congress and federal agencies that deal with this subject.